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ABSTRACT

A study explored the thoughts people have as they interact with others in conversation. Individuals were asked to communicate with each other over networked microcomputers and as they typed their messages, they spoke aloud their thoughts about the exchanges. These oral protocols, matched with the messages exchanged over the network, were then closely analyzed to assess the thoughts that occurred during collaborative discourse. Results provide evidence for three processes found in conversation: inferencing, planning, and coping with violations of maxims or implicit rules about the ways people are supposed to converse. Subjects made inferences about the other person and about the conversation, planned their conversation strategies as they moved through the interaction, and reacted to violations of maxims. The use of protocols was successful in that people were able to carry on two conversations at once and the technique provided interesting and important information about interactive discourse. Limitations of the procedure include individual differences in subjects' capacity to engage in the task, the "reality" or validity of the thoughts obtained through protocol, and possible diminished authenticity of conversations without their oral and visual aspects. (Examples of conversations and protocols are included throughout the text.) (SRT)

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Concurrent Cognitions During Conversations: Protocol Analyses as a Means of Exploring Conversations

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Abstract

Critical to understanding cooperative discourse is the identification of the cogni tive processes that occur as individuals interact. Previous attempts to explore the thoughts people have as they interact have been inherently limited by their inabil ity to tap into concurrent cognitions: the thoughts people have during interaction. We propose using networked computers where individuals (all who are expert typists) communicate with one another over terminals and simultaneously talk-aloud their thoughts. We demonstrate, through summaries of on-going research, that the technique can provide important evidence for a wide variety of conversational characteristics. Moreover, we provide evidence for the validity of certain conversational maxims that, up-to-now were assumed, but never displayed in normal collaborative discourse.

Concurrent Cognitions During Conversations: Protocol Analyses as a Means of Exploring Conversations

In recent years, investigators from a variety of disciplines have undertaken the study of interactive discourse. Understanding the ways people work together to accomplish interaction is a central issue for interpersonal communication scholars. Conversations are joint productions, achieved by co-participants who must collaborate in their construction, and who mutually expect that certain things will happen in certain ways at certain points in the talk. Grice (1975) argued that a 'cooperative principle,' implicitly known to participants, guides speaker contributions. Others broadened Grice's speaker-centered theory to one which includes the listener as an active contributor to cooperation, positing, for instance, a 'charity principle' which governs a hearer's interpretation of a speaker's utterances (Bach & Harnish, 1979). In their examination of ordinary, day-to-day talk, conversation analysts (Sacks, 1972; Sacks, Schegloff, & Jefferson, 1974) have found evidence of precise, fine-grained speaker-hearer coordination of such surprisingly complex action sequences as turn-taking and conversational repair. In other contexts, such as co-authoring systems, human-machine interactions, and mediated conversation systems, cooperation among participants is similarly essential. To fully understand interactive discourse, it is important that we understand what each individual brings to the collaborative task, what he or she infers during the task, and the ways in which those inferences affect the accomplishment of task.

In the project we describe here, we are interested in what people are thinking as they converse with each other. That is, what judgements, perceptions, feelings, projections, and so on occur as people engage in social exchanges? Previous attempts to probe this concern have typically taken one of three forms: experimental, descriptive, or retrospective. In experimental models, investigators create a situation where some variable, presumed to affect an exchange, is systematically manipulated (e.g., Greene, 1984). The impact of that manipulation is observed and cognitive processes are inferred. Descriptive approaches (e.g., discourse analysis) make similar inferences about thinking from examinations of natural text (e.g., Philipsen, 1986). Retrospective approaches probe participants' memories to determine relevant cognitions (e.g., Stafford & Daly, 1984). While regularly used, each of these methods has limitations. Experimental procedures often suffer from a lack of external validity. Descriptive approaches are based not upon participants' reports, but rather observers' judgements of what appeared to happen. Retrospective accounts may be biased by intervening events: what is recollected at time three about time one, for instance, may be biased by what occurs at time two.1

The major problem, however, with any current methodological approach, be it experimental, descriptive, or retrospective is the inability of the technique to capture concurrent cognitions: what individuals think while they make conversational decisions as speakers or listeners. Perhaps the closest method for obtaining these reports would be through some form of

protocol analysis (Ericsson & Simon, 1984), a technique that makes use of people's verbal reports about their cognitions as they engage in some task. Innumerable applications have been made of the procedure in a wide variety of disciplines ranging from medicine and business to education and writing (Ericcson & Simon, 1984). Among other things, it has been used to determine the cognitive strategies that distinguish experts from novices and to identify problems learners have when engaged in some task. While space limitations preclude a thorough review of the technique, there is considerable evidence justifying it as a research option as well as a heuristic technique for understanding mental processes.

On the surface, however, such a procedure seems difficult if not impossible to utilize when working with on-going conversations: one cannot orally converse about some topic and simultaneously describe aloud his or her thoughts. Upon reflection, one alternative came to mind: using a different mode than orality for conversation. In our studies we asked individuals who were highly skilled typists to communicate with each other over networked micro-computers.2 As they typed their messages to each other, we asked that they talk aloud their thoughts about the exchanges: what was happening, why they were saying one thing rather than another, what their impressions of one another were, and so on.3 These oral protocols, matched with the messages exchanged over the network, were then closely analyzed to assess the thoughts that occurred during collaborative discourse.

Although the technique has limitations, it does permit us to obtain a clearer image of the thoughts people have concurrent with their interactions. More broadly, it provides insight into the decision-making processes that arise as people come to cope with the myriad of problems accompanying interactive discourse, where neither individual alone has complete control over what is happening in the exchange. It also offers us the opportunity to better understand a number of research results that utilize mediated interactions (e.g., Chapanis, 1972, 1981; Kiesler, Siegel & McGuire, 1984).

In this paper we provide some initial results of research using this technique. We offer evidence for three general processes found in conversation: (a) inferencing, (b) planning, and (c) coping with maxim violation. What follows are, in essence, case examples of the sorts of data we are obtaining. Taken together they demonstrate that the protocol technique permits us to both obtain information about cognitive processes that occur during conversation and empirically test certain previously untestable assumptions about the nature of conversation.

Inferencing in Conversations

Any conversation requires that each participant make a number of judgments about the others involved in the exchange and about the exchange itself. How do these judgments come about? They arise in part because of prior experience with the person, in part from impressions formed from appearance, and in part because of histories individuals have with conversations and resulting expectancies about how conversations work. The statements made by a person during the interaction, however, also shape the inferences formed by others in probabilistic ways. In the studies that follow, participants were unacquainted and never actually saw one another. Thus, inferences were based entirely upon the text each one contributed to

the exchange. Only one person was an actual subject (S); the other individual was a confederate (C) who attempted, at times, to systematically manipulate the conversation to affect inferences and judgements made by the subject. Two sorts of inferences will be noted: those about the other person and those about the conversation.

Person Inference

The following conversation has been going on for approximately four minutes. The participants have discussed a number of topics and the conversation has moved to discussing cats. [Subjects are instructed to talk aloud about whatever comes to mind including reading aloud what is seen on their screen. When a subject reads aloud the screen content, we indicate this by putting those statements in parentheses. Experimenter's comments are displayed in brackets.]

	Conversation	Protocol of S
A1	C: ...my cats just had	(My cats just had
A2	kittens	kitten)
A3		Oh. I like cats.
A4	They're really	(They're really
A5	ugly!!	ugly)
A6		Ahh!
A7	S: Cats are not ugly. I	(Cats are not ugly. I love cats.)
A8	love cats.	You idiot!
A9	I have a white, fat,	(I have a white fat
A10	cat named Miss Kitten. I	cat named Miss Kitty. I
A11	think I miss her more than	think I miss her more than
A12	I miss my mother. Don't	I miss my mother. Don't
A13	you like cats?	you like cats?)
A14		I think I keep thinking this person
A15		is a boy, I mean because she doesn't
A16		like cats, she wanted to be a neuro-
A17		surgeon, she's so sarcastic. Most boys
A18		are like this.
A19		
A20	C: I love them but trust me,	
A21	these kittens are uuugly!	(These kittens are ugly.)
A22		I don't believe you. I really don't
A23		believe you.
A24	I hope they improve	(I hope they improve)
A25	with age	They will (with age)

This excerpt is somewhat typical of the protocols we have obtained. Note lines A14-A18 where the subject makes inferences about the other that, while clearly occurring in the subject's mind, are not revealed in the actual conversation. The subject is inferring characteristics of the other person based upon the other's comments. Clearly, the inference made above is influenced by the lack of face-to-face contact, leading the speaker to try to imagine the gender of the other participant. However, subjects also made a number of person inferences that were unaffected by the technique. Consider a second conversation:

	Conversation	Protocol of S
B1	C: I hope to be able to get	
B2	a beginning management job	(a beginning management job
B3	with a good company like	with a) big (company)
B4	IBM...that's my dream	I think she's excited about her major
B5		obviously,
B6		[What makes you say that?]
B7		Because it was like she was just waiting
B8		for somebody to ask her that and this is
B9		her big chance to tell you.
B10		.
B11		.
B12	I figure with good	.
B13	grea (restart) grades,	
B14	and a willingness to move,	
B15		Oho, so she believes in work hard and
B16		get whatever you want if you play by the
B17		rules. Now I am wondering why I'm even
B18		trying to stereotype her I guess trying
B19		to put her into some category
B20	I should stand a pretty	(should stand a pretty
B21	good chance	good chance)
B22	UT's	(UT's) she's going to say something
B23	department	about the rela--the reputation
B24	is really good. So that	Its a really good school.
B25	helps	So she thinks--she's relying on the
B26		school to help her get a job.

Again, the subject (a different one from the first) makes a number of inferences about the person: her conversational goals (lines B7-B9), her thoughts about success (lines B15-B17), her feelings about her major (line B4), as well as some prediction about where the conversation is going (lines B22-B23). In addition, we see the subject making some inferences about her own conversation judgment (lines B17-B19). Interestingly, in her response to the statements of C, the subject never acknowledges any of these thoughts. Indeed, as soon as she "gets the floor" she switches topics. One of the consistencies we have noticed throughout these projects is that subjects have many thoughts during the task that never appear in their conversation with the other. In many cases, though, these inferences shape the person's interaction patterns later on in a conversation.

Conversation Inferences

In addition to forming inferences about the person, subjects also make inferences about what the other will say (see lines B22-B23, above). Consider these examples:

	Conversation	Protocol of S
C1	S:IBM sounds like its you	(IBM sounds like it
C2	(restart-erases you) on the	on the
C3	Fortune 500 list, is that	Fortune 500 list, is that

C4	part of your goal, does the	part of your goal? Does the
C5	company have to be big?	company have to big?)
C6		
C7		Okay. Now I'm predicting that she's
C8		gonna say it doesn't have to be big
C9		but she wants it to be successful or
C10		or something like that.
C11	Well they have to have	(have to have a
C12	good management philos-	good management philos-
C13	ophy,	ophy?) That's vague to me. I don't
C14		know what she means by that and she's
C15		thinking now. I want to read her mind
C16	and carry it out too.	(and carry it out too.) OK.

	Conversation	Protocol of S
D1	S: ...its only a half	
D2	hour away frojn (restart)	
D3	from Disneyland.	
D4		Now she's going to ask if I've
D5		ever been there. Okay. Oh, and it
D6		bothers me when people get Disneyland
D7		and Disneyworld confused because they're
D8		totally different and not anything the
D9		same and Disneyland's the original one.
D10		You know, even through I've never been
D11		to Disneyworld I, you know, I have to
D12		claim it's the best just because I've
D13		been personally close to it.
D14	C:Oh. Cool.	Have you been? Real (cool)

In both cases we see the subjects make predictions about the response of the other person to some statement they made (lines C7-C10; D4-D5). Projections about the possible thoughts of another (eg., lines D6-D9) are also noticeable.

Drawing inferences about partners or about the likely response of partners seems a very common cognitive activity during collaborative tasks. Using the protocol technique we have obtained a number of examples of predictions about what the other is likely to say during an interaction and have begun to explore the participants' reactions when their predictions are either confirmed or disconfirmed. It may well be that the sorts of inferences change as the relationship changes. In initial encounters we find stereotypic responses that seem to be based on a desire to reduce one's uncertainty about another (Berger, 1976). In later interaction participants' predictions may change qualitatively. To the degree that prediction-making of this sort shapes what an individual does or does not do during a task, it becomes critical to determine the sort of expectations different types of information elicit. We are beginning to explore what exactly provokes an individual to generate different kinds of inferences in conversations.

Planning

Virtually any model of cognition and communication suggests that participants plan their conversational strategies as they move through the interaction. The dilemma faced by people interested in examining this planning process is that there is no way, by strictly listening to a conversation, to obtain evidence for this planning activity. In many of our protocols, however, we find participants actively engaging in planning. Consider the following excerpt (the confederate has just said that her name was Holly):

	Conversation	Protocol of S
E1	S: My name is Leslie.	Okay, (my name is Leslie.
E2	I know someone named	I know someone named
E3	Holly in my Spanish	Holly in my Spanish
E4	class, do you take	class. Do you take
E5	Spanish?	Spanish?)
E6		So now, well, I'm just waiting to hear
E7		what she's going to say. If she says
E8		yes then I guess I'll probably ask her
E9		probably her major or try to find something
E10		else we have in common.
	.	.
	.	.
	.	.
E31		Okay,I'm going to tell her that
E32	I'm a sophomore	(I'm a sophomore).
E33		And I'm going to ask her what her
E34		major is. Let's see
E35	Whyat (restart) what	(what) whoops (what
E36	is your major?	is your major?)

The subject in this case forecasts her plans to ask a certain question (lines E7-E10) and, indeed, later in the exchange, follows through with the planned question (lines E33-E34). A number of factors have been noted to affect the plans and subsequent actions people make in conversations. One is the perceived requirement to be polite throughout the exchange. For instance:

	Conversation	Protocol of S
F1		Well, I think I'll just, how about
F2		thank her for that last piece of
F3		information, which is hypocritical but
F4		I'm going to do it anyway just to be
F5		polite.
F6	S:Thank you for that	
F7	piece of information	

Lines F1 to F5 reveal both the subject's plans about what she will say as well as her reasons for saying it. Despite the fact that she is not actually grateful for "that last piece of information," she adheres to what Leech (1983) has termed a politeness maxim: She plans to thank the other, even though it is "hypocritical...just to be polite." In lines F6 and F7 we see

that the subject follows though with this plan.

Testing Conversational Maxims.

A major theme in pragmatics concerns "maxims" or implicit rules about the ways people are to converse. Grice (1975), for instance, suggests four maxims: relation, quality, manner, quantity. The relation maxim says one's contributions to a conversation ought to be relevant (see Tracy, 1983; Sanders, 1983), manner implies perspicuity (i.e., avoid obscurity), quality refers to truthfulness (see Mura, 1983), and quantity says one should say enough, but not too much. Grice argues that noticeable violations of conversational maxims may stem either from a clash of applicable but temporarily contradictory maxims, or from deliberate violations (floutings) which require the hearer to work out the apparent contradiction between the maxim violation and adherence to the supraordinate cooperative principle. This task demands that the hearer infer what the speaker has indirectly implied. Such direct violations, in other words, burden the hearer with discovering how the speaker has been cooperative, and Grice assumes that hearers will do just that.

Other writers have added to the catalog of maxims. Bach and Harnish (1979), for instance, posited two charity principles admonishing hearers to construe speakers' remarks as violating as few maxims as possible, and as violating those maxims which are least important in a given conversation. Approaches such as this suppose that hearers assume coherence and look to implicature to discover just how a speaker who has violated a maxim is being cooperative. Intuition and everyday experience, though, suggest that hearers do not always assume that violations are well-intended attempts at indirectly conveying meaning; it seems likely that hearers notice and object to some violations of certain maxims on the grounds that speakers are not being cooperative.

Demonstrating hearer reactions to speaker violations, however, has been difficult. Leech (1983) and others (e.g., Goody, 1978) argue that a politeness maxim requires that conversational participants work at saving face, making sure that neither self nor other is embarrassed during the conversation by what is said. Thus, were a person to violate the relevance maxim, many times we would not see any reaction from the other interactant because of politeness. The other would either ignore the irrelevancy or adapt his or her conversation to the irrelevancy instead of embarrassing the person by offering any observable reaction to the irrelevant contribution. The same should be true with violations of any of the other maxims. To test these ideas about what, if anything, hearers think and say when maxims are violated, we had a confederate "talk" with subjects (over networked computers) and intentionally violate the quantity maxim.

Quantity Maxim

The quantity maxim suggests that conversants should say enough, but not too much, about a topic in a conversation (Grice, 1975). This maxim is one whose violation seldom generates explicit responses from the receiver (but see Mura, 1983, on speakers' moves to license violations), perhaps because of politeness demands. The question is whether people really react to the

violation. This can be tested by examining protocols. Consider the two cases below:

	Conversation	Protocol of S
G1	C: Where in California	(Where in California) do you
G2		live? Thats predictable.
G3		Is that all I'm gonna get?
G4		Now I'm disappointed. That's all I got.
G5	S: Los Angeles, 25 mile	
G6	east, to be exact, in a	
G7	quiet little suburb	

	Conversation	Protocol of S
H1	C: Wow. A steer and a bull?	(Wow. A steer and a bull.
H2	Isn't that dangerous? Sounds	Isnt't that) Interesting? (Sounds
H3	to me like you have a brave	to me like you have a brave
H4	brother. Does he show pigs?	brother. Does he show pigs) She
H5		likes the sound of pigs, doesn't she?
H6		How about baby pigs.
H7	I just love baby pigs.	Oh my goodness (I just love baby pigs.)
H8		/laugh/
H9	Whenever I go to a fair, I	(Whenever I go to a fair I)
H10	love to go see the baby pigs	have (to go see the baby pigs
H11	because they are soooooo cute.	because they are soooooo cute)
H12		Oh my goodness
H13	I	(I) she certainly talks more than
H14	don't really like their	I do (don't really like their
H15	mothers and fathers, but the	mothers and) their (fathers, but the
H16	babies are adorable. If they	babies are adorable. If they
H17	stayed little I would have	stayed little I would have
H18	one for a pet.	one for a pet).

In the first conversation, the subject feels that the other is not contributing enough (lines G3-G4), yet responds, in the actual interaction, as if all were normal (lines G5-G7). The protocol reveals a negative response. In the second case, we have the opposite event occurring: too much information. Again, the subject listens (or reads in the case of this methodology) while at the same time reacting negatively in the protocol (lines H13-H14). In sum, when quantity is violated, by either too much or too little talk, we see no reaction in the actual conversation but significant reactions in the protocols. People, being polite, do not react aloud, but their thoughts reflect the maxim nonetheless.

Intimacy Expectations

Berger et al. (1976) found that communicators have expectations about the sequencing of information exchange in initial interactions. Subjects judged relatively impersonal topics, such as basic demographic information, as appropriate for the beginnings of such interactions, and more intimate topics as appropriate only after a considerable amount of time has elapsed and a considerable amount of less intimate interaction had occurred. Were an

individual to violate this assumption, we would expect to see the consequence either in the actual interaction or in the protocol that accompanied the interaction. Consider the following excerpt:

	Conversation	Protocol of S
I1	C: I really miss it. I still	
I2	get homesick, I mean I like	
I3	it here but its not san	
I4	diego. Oh well. Maybe	
I5	I'll be able to get a	(be able to get a
I6	job there.	job there.
I7	I hope so.. my dad's	I hope so. My dad's
I8	retiring next year,	retiring) Ooh! Got an older
I9		father, I guess. Not necessarily
I10		but that's what I assume. Unless
I11		he's just rich. I should ask that.
I12		So I'll ask her out if she has money.
I13		No, I wouldn't do that.
I14	because he's had some	
I15	health problems	Oh cause he ooh that's sad.
I16	(cancer, really)	Nine of them? No, that's mean
I17	and my parents are going	
I18	to need some financial	
I19	help.	I'm sure. Oh wow. Oh, I'm sure
I20		she's telling me this and I haven't
I21		even met her yet. What am I supposed--
I22		I feel bad but God she's not supposed
I23		to say this the first time. I mean, I
I24		can't even see her face.
I25	My brother is un-	I'm e--
I26	employed, so he can't	(my brothers unemployed. So...)
I27	help...	Oh, my gosh! What am I supposed to say
I28		about this? I was born in Cleveland, is
I29		that enough? ((laugh))
I30	It's sort of scary.	(Its sort of scary.)
I31		I can't s--
I32	S: I'm sorry. I'll say a	um ((typing))
I33	prayer for you.	(a prayer) for him. (For you). I should
I34		say them.
I35	I went to a Catholic	
I36	School also ((...))	

This protocol is revealing in a number of ways. First, note the operation of the intimacy expectation in lines I20-I24. The subject, implicitly aware of a rule that proscribes revelations of intimate information too early in an exchange, must deal with a violation of that rule. In the actual conversation we see the subject responding in a supportive, relevant way. In the protocol, though, we discover some other reactions---ones of concern about the nature of the conversation. Indeed, at the end of this excerpt, we find the subject actually retreating to a "safer" topic. Second, note the inference that is made toward the start of the exchange about the father (lines I8-I11). The subject infers from a limited amount of text to person characteristics. These inferences, similar in nature to those described on pages 6-7, may or may not

appear in the actual conversation, but clearly they are thoughts that occur during the exchange. Third, note the planning that occurs during the exchange. The subject makes a plan to ask the other person more about his or her parent (line I11).

Another example of such intimacy expectations occurs in the conversation excerpt below. Here we find the subject wondering aloud (lines J4-J5) about the degree to which she has violated an implicit rule about how intimate she's getting in the conversation.

	Conversation	Protocol of S
J1	S: Does your boyfriend live in	
J2	California or here?	
J3		[What are you thinking?]
J4		Uhm, if I'm digging too deep
J5		or if I should leave her alone.
J6		She's taking an awful lot of time
J7	C: He goes to school at Yale	(He goes to school at Yale)
J8	but he's taking the summer	
J9	off, too.	

Discussion

We started this project with a very basic question: What are the underlying cognitive processes that operate when people converse? More traditional approaches were rejected in favor of a form of protocol analysis which required subjects to communicate over networked computers and simultaneously provide oral reports of their thoughts. Two criteria were established for assessing whether the technique was successful: (1) was it something people could do and (2) would we garner interesting and important information about interactive discourse. Based upon the studies completed to date, the answers to both are positive.

We find that the protocols offer us a wealth of information about the thoughts people have as they converse. For instance, strong initial evidence for both inferencing and planning in social exchanges has been found. While we are only now beginning to engage in close examination of these processes, it is clear that people do both in conversation. We also find supportive evidence for the role of conversational maxims. People seem to react to violations of the maxims even though the transcripts of the conversation, per se, fail to reveal any overt response. The findings about the maxim violations are especially important as they provide empirical support for propositions that have, up-to-now, been seen as so implicit as to be unprovable. If nothing more we have, we think, demonstrated the relevance of those maxims to conversation.

In addition to close analyses of the decision-making processes involved in mediated conversations, we are also exploring differences in the decision-making strategies of people who vary in their degree of "conversational complexity." Using a technique devised by Daly, Bell, Glenn & Lawrence (1985) we have identified people who might be considered "experts" and "non-experts" in conversational knowledge. We have, in preliminary studies, found that highly complex individuals offer distinctly different

thoughts about conversations than those low in the complexity. Experts construe conversations differently than non-experts.

Clearly there are potential limitations to the procedure. The first is whether or not there are individual differences in people's capacity to engage in the task. Clearly there are: some people are much better at providing protocols than others. We have not yet empirically identified the best predictors of this ability although we suspect that certain reflective skills on the part of a person are critical. A measure of these skills in conversational settings is currently being developed. In preliminary work we have found that virtually every subject that performs well in the protocol task also scores far above the mean on this measure which has tentatively been labeled "conversational sensitivity."

A second concern focuses on the "reality" of the thoughts we obtained in the protocols. Are the protocols descriptions of what the individuals typically think as they converse or are they, instead, nothing more than thoughts created for the experimenter? This concern for validity takes a number of forms. However, the answer in every case is the same: to the extent that subjects appear quite capable of describing thoughts that co-occur with their conversations and to the extent that these thoughts map closely, in many cases, to other sorts of research on conversation, unknown to the subjects, we can justifiably argue that the reports have some degree of validity. Moreover, we find that as conversations become more problematic for subjects, their reports become more extensive. One might reasonably suggest that many sorts of conversations are highly overlearned---they occur without much obvious conscious effort on the part of participants (e.g., greeting rituals). Other sorts of exchanges, however, require much more conscious processing. When we created situations where the conversation seemed to go awry, subjects' protocols reflected this complexity. Finally, even if we are creating greater awareness of conversation through the procedure, the results provide us with subjects' interpretations of what is happening to them and, as Ericcson and Simon (1984) have suggested, this sort of concurrent self-report has good validity as a representation of actual underlying cognitions. We might also indicate that the experimenters who were present in the room as subjects reported their thoughts were trained to be especially careful about reacting to them so that the only contributions the experimenter made were procedural ones (e.g., "now press the return key", "make sure you keep telling us your thoughts"). If what we have captured is someone "holding two conversations at once" there is no reason to believe the thoughts expressed about the exchange are different in kind from those that occur during actual conversations.

Implicit in this validity concern is a question about whether people are actually engaging in "conversation." Some people who have discussed this project with us have argued that by eliminating the oral and visual aspects of conversation we are not mimicking "real" conversation but rather are creating some odd variant of the activity. To some degree, they may be right. For instance, Kiesler and her colleagues (e.g., Kiesler, et al., 1984; Kiesler, et al., 1985; Seigel, et al., 1986) have found that when people interact over computers their behaviors are, compared to people interacting face-to-face, somewhat different. For instance, in computer-mediated discussions people make fewer remarks, take longer to make group decisions, participate more equally, and exhibit more uninhibited behavior than people

do in face-to-face exchanges. However, many of the critical constituents of conversation (Nickerson, 1981) are nonetheless present in computer-mediated exchanges. They have mixed initiatives, bidirectionality, rules for turntaking, informal language, common world knowledge, and so on. Moreover, to say that people are less inhibited, make fewer statements, or take longer in decision-making does not necessarily mean that their underlying cognitions are different in this activity than when engaged in face-to-face conversation.

Indeed, when we look at the transcripts of the mediated exchanges, we find very little that inherently distinguishes our conversations from those encountered in everyday interactions. To test this empirically we conducted an experiment in which subjects evaluated samples of computer-mediated conversations and "normal" conversations. Fifty-four undergraduate received packets that contained an assortment of conversation excerpts. Approximately half of the excerpts in each packet were from the materials we collected in the studies described in this paper; the other half were from conversations collected in other investigations where people's everyday conversations were videotaped and then transcribed. The excerpts from the computer-mediated exchanges were selected randomly from the conversation samples; the excerpts from the normal exchanges were selected to match, approximately the content of the computer-mediated exchanges. For instance, when a greeting exchange was chosen from the computer-mediated exchanges a greeting was also selected from the "normal" conversations. In the end, fourteen excerpts of computer-mediated exchanges and fifteen excerpts of natural interaction were selected. Random assortments of these twenty-nine were placed in each packet. The only rule for assigning excerpts to packets was that each packet was required to contain approximately equal numbers of mediated and normal conversations. Given the amount of time required to complete the ratings, each packet contained ten excerpts. In the end, each excerpt received between seventeen and twenty-one ratings. Subjects evaluated each excerpt using six, seven step scales (natural-unnatural, normal-abnormal, competent-incompetent, clear-unclear, typical-not typical, usual-unusual) that when combined into a composite provided, across excerpts and subjects, a highly reliable measure of perceived normalcy (alpha=.92). The evaluations were assessed in two different ways. First, mean judgements of normalcy for the mediated conversations and the "normal" conversations read by each subject were calculated. Then, the means were averaged across subjects and compared using a t-test for related pairs. If, overall, there were differences in judgements of the conversations as a function of whether or not they occurred over the computers, we would anticipate a significant t-value. That was not the case ($t(53)=1.09$, ns). There was no overall difference in perceived normalcy between the mediated and "normal" exchanges. Second, the excerpts were paired on the basis of what was being done in the conversation (e.g., greeting ritual). The mean judgement for each pair member was calculated and contrasted. In ten out of the fourteen tests (fourteen mediated excerpts contrasted with fourteen related "normal" excerpts), there were no significant differences. In the other four, the differences that emerged seemed random: two were in favor of the mediated excerpts; two were in favor of the natural excerpts. Taken together it seems that, at least in the eyes of raters, the conversations that occured over networked computers were no different, in terms of judged conversational normalcy, from those found in everyday face-to-face interactions.

Nevertheless, if criticisms of this approach were to hold for generalizations to everyday, face-to-face exchanges we still are obtaining findings that have potential importance for communication activities that are mediated through computers (e.g., co-authoring systems). More generally, in the end, we suspect we will be able to provide some important contributions to the design and implementation of systems that require some understanding of the ways people construe interactions with and through machines (e.g., human-computer query systems). Studies of question-answer systems in computers (e.g., Shwartz & Lehnert, 1985) are a case in point as are general plan based models of social interaction (e.g., Shank & Abelson, 1977).

Notes

[1] There are some other techniques that have been used a few times in attempting to probe concurrent thoughts in communication encounters. Garfinkel (1967) had subjects describe their impressions of a question-answer sequence after receiving each answer. Brooks and Scheidel (1968) had listeners provide their thoughts at experimentally created pauses in a speech.

[2] Expert typists were capable of typing fast enough to maintain a fluid conversa tional pattern. We made use of a program called CONVERSE which operated from a DEC-20. The program was written at Carnegie-Mellon University. We appreciate the help of David Zubrow in obtaining the program. We have recently written a program suitable for networked micro-computers.

[3] In more popular settings, Woody Allen has made the procedure a central part of some of his films (e.g., Annie Hall, where in a meeting between the two characters we see bubbles of thoughts appearing above each person as they converse with one another).

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